Notice

Description EP0020257

[0001] The present invention relates to a device for the installation of a subsea pipeline consists of components assembled end to end on a carrier such as a platform or a vessel equi when the assembly said elements connected end to end at the end of the portion of the pipe already released.

[0002] The device of the invention to allow the installation of a subsea pipeline under the technique imagined but not yet used to the pose known as J. In this technique, the immersion when it settles on the seabed
This technique has the advantage of reducing the mechanical stresses to which the pipe is subjected at the time of installation, compared to the conventional insertion technique calle

[0003] For cons, the insertion technique known as J runs into serious difficulties that aims to solve the present invention.

[0004] Among these difficulties, it should be noted range of motion vertical displacement of the ship subjected to wave and that should free the pipe has already been asked.
Another difficulty relates to the assembly by welding a piece of pipe at the end of the game already released.
Indeed, the pipe elements that are assembled at the end of the portion of pipe already dropped will not have a length given the relatively limited vertical positioning of the elements inv make the length of the ship installer can be used.
As a result, the technique requires the J-lay if you will be able to ask reasonable lengths of pipe per unit of time a device adapter that allows a very rapid assembly of pipe elements at assembly and installation equally fast a new element that must be assembled after the previous one.

[0005] Devices for the J-lay pipeline have been devised in which are assembled end to end of pipe elements which are fixed to the end of the emerging substantially vertical pipe alrea may switch between a substantially horizontal position and a substantially vertical position and a raised mast equipé de input means and training to capture and train together to the m input means and training are provided that are likely to lower said pipe element with a voltage substantially constant regardless of the proper motion of the heave carrier and substanti means and said end support, and means for controlling said means of support are likely to support said end a voltage substantially constant regardless of the heaving movement of th

[0006] Such devices have been described including patents France n [deg.] 75 14 079 (n [deg.] Publication 2,310,515) filed May 6, 1975 in the names of the French Company of Oil a Grands Travaux de Marseille.

[0007] The device of the invention for the J-lay a pipeline is the general type previously described and characterized with respect to it in that, to simplify and speed up the process of la working alternately, may be lying in a substantially horizontally in the direction of the carrier, the other in the opposite direction.

[0008] Such a device overcomes operations connecting elements to the pipeline of heaving movement of the ship.
it also l'approvisionnement-elements on each pole loading in a horizontal position, which facilitates the storage and handling.
In addition, the poles can work alternately, one being loaded into a horizontal position, while the other is vertical to allow the assembly of a pipe element to the end of the pipe already

[0009] According to another feature of the invention, the aforementioned means of input and support of the end pipe is moving within a support structure attached to the carrier being g In this way, it is possible to fully automate the assembly operations are done in the absence of any relative movement between the free end of the pipe, the element that has just been exterior finishes, etc.

[0010] The invention will become clearer with the following description with reference to the accompanying drawings illustrating a method of implementation.
In these drawings:
- 1 is a diagram illustrating a side view of a vessel equipped with a positioning device of the invention.
- Figure 2, shows the same vessel seen from above.
- Figure 3 shows a larger scale and side schematic with parts that were removed for clarity various major parts of the device.
- Figure 4 shows schematically in Figure 1 as a phase of operation of the device.
- Figure 5 shows the direction of arrow V in Figure 4 of the provision of two derricks of pipe elements.
- 6 and 7 show in Figure 4 as two phases of operation of the device.
- Figure 8 shows schematically by the arrow VIII in Figure 4 the laying ship from the rear
- Figures 9-16 are diagrams explaining how is the approach and the assembly of a pipe element at the free end of the pipe already laid and its release to the installation of a new elem

[0011] Please refer first to Figure 1 where we see a vessel for the installation of a so-called J-2 on the bottom line marin'3.

[0012] In this technique, the pipeline consists of two pipe elements which are joined end to end at the end of the portion of pipe already released.
As each new element 4 is made to that effect in substantially vertical position above the end of Part 2 already in the pipeline and dropped on its axis to allow the assembly of the new This positioning of the item 4 above and in alignment with the end of the portion of Line 2 is achieved by means of a mast 5 may tilt about an axis 6 and is equipped with means for ca

[0013] In order to reduce downtime, a second pole that switches 7 about an axis 8 is likely when the mast is upright 5, to be loaded in the horizontal position of another element of line

[0014] When the element 4 has been assembled as described below to l'extrémité of the pipe 2, it will toggle the mast 5 to the horizontal position while you bring the mast upright 7 fo Advantageously, if the mast 5 is provided to switch to the front of the ship before the mast 7 is scheduled to swing back so that the AR poles loading pipe elements can work alternate

[0015] As shown in Figure 2, items 9 can be loaded when the mast is horizontal 7 from a store elements 9 ', while similarly, the four elements will be loaded onto the 8 when the mast

[0016] Furthermore, as will be explained later, is expected within the pipe 2 a package of safety equipment and measurement including at least one safety cap 10 attached at the end elbow of the pipe 12 '.

[0017] The cap 10 which advances as and when the installation is to prevent the portion of pipe already laid on the seabed 3 to be drowned in cases of gross deception or breach of th

[0018] Furthermore, it should be noted in Figure 1 that the two poles 5, 7 are organized around the axis 6, 8 on a support structure 13 attached to the vessel 1.
The pivoting movements of the poles 5, 7 are controlled by actuators 14, 15 and 16.
The cylinder 14 is articulated between the mast and the vessel 5, the actuator 15 between the mast and the vessel 7, while the cylinder 16 connects the two poles 5, 7 two-point not to lowering masts and lighten the entire structure.

[0019] Refer to Figure 3 in which we see more precisely the mechanism allow l'assemblage elements such as line 4 of the free end 2 'of the portion of line 2 already released.

[0020] The mast 5 rotates around the axis 6 of a pivot 17 supported on the support structure 13.
in 18, we see the counterweight pour'l'équilibrage part of the mast.

[0021] In Figure 5, we see the particular form of U in the basis of the two poles 5, 7, which allows free rotation of the two poles around their pivots 17, 19 at opposite tilting movements

[0022] In the illustrated example, we see that the lines 6, 8 pivots 17, 19 are offset from the axis 20 par rapport substantially vertical content in the median plane of the two axes, which end 2 'of the portion of line 2 already established.

[0023] To avoid subjecting the pipe 2 constraints ups, its top is fixed and supported by two clamps 21 respectively, who work 22, usually alternately
These clamps have configurations that allow them to grip and support the pipe 2 without damaging the siding.
They are themselves supported by cables such as 23, 24 which pass over pulleys 25, 26 and roll up capstans 27, 28.
These winches are of a type known to exercise on the cables 23, 24 substantially constant tension.
This allows to free the claws 21, 22 of heaving movement du navire.
In other words, the end 2 'of the pipe 2 remains substantially constant level from the bottom of the sea rises and falls within the structure 13 which compensates for the heave motion c

[0024] The capstan 27, 28 may be driven by engines such as constant torque.
Alternatively, an accelerometer measuring device can control the motors of the winches to compensate for the vertical movement of movement of the vessel due to the swell.

[0025] These devices are of a type known commercially available will not be described, not part of the invention.

[0026] As will become apparent later, the two clamps 21, 22 act in combination to allow also the descent of the pipe into the well 29 release after assembly of a pipe element 4.
To this end, the clip 21 clip called "fixed" is used to maintain substantially constant level in line 2 when the clamp 22 so-called "mobile" is not used to go down the pipe 2 to the desired
Alternatively using one of the clips or the other, one can get the desired length of the pipe.

[0027] On the pipe 2, is also planned, as indicated at 30, a parachute clip that is suspended by cables 31 passing over pulleys 32 and strained by tension-neurs jack 33 which provide
These tensioners are-of a known type for hydraulic cylinder and air supply pressure.
In normal operation, the clamp 30 parachute following the pipe 2 to the downward movement in the normal installation of the pipe after assembly of an element 4.
By cons, it blocks the pipe 2 in case of sudden acceleration in this example as a result of a lack of flexibility or a crack in the pipe leading to a water filling of the latter above 10 Bouchi
Of course, we use many tensioners 33 and capstan 27, 28 as necessary, working in parallel, efforts to obtain the desired view of the depth of installation and type of pipe installed.

[0028] Advantageously, are also provided within the support structure 13, two ring guides 34, 35 also heave compensated and in which the pipeline passes.
The guide 34 is secured to the étr e fixed clamp 21, while the guide 35 can be secured to the clamp 30 parachute.
These guides may be formed for example by three wheels spaced angularly about axis 20 and rolling on the exterior of the pipe 2.

[0029] As shown in Figure 3, when an element such that the element of line 4 is loaded on one of the two poles 5 or 7, item 4 is developed and guided to the inside guides, for exampl
to the axis of the mast 5. These guides 37peuvent be formed by the wheels angularly distributed around the pipe.

[0030] In this way, when the mast 5 is vertical, it allows to match exactly the axis of the 4 with the axis 20 of assembly.

[0031] To allow the movement of the pipe 4 on the mast 5 is advantageously used a device known 38 says "tensioner" and includes two sets of wheels 39, 40 resting on both sides of
The bearings 39, 40 are controlled by motors that can drag the item 4 parallel to the axis of the mast 5 speed-controlled motors.

[0032] Advantageously, as these engines are the engines of capstans 27, 28 motors for constant torque in the vertical position of the mast to free the element 4 automatic movement v
So the tensioner 38 provides automatic heave compensation element 4 and can approach and easily assemble the element 4 at the end 2 'of the pipe 2 itself heave compensated as i

[0033] The assembly is reconciled to the item 4 until it comes into contact with the end 2 'of the pipeline approach movement which is obtained by a corresponding control of the tensio

[0034] In Figure 3, we see also a capstan 41 and 5 attached to the mast on which is wound a cable 42 which receives after passing over a pulley 43 a train of 44 shown schematically
to Figures 9 to 16.

[0035] The capstan motor 41 is also preferably of the type constant torque which will provide automatic compensation of the heaving movement of the train 44 suspended from the cat

[0036] will now be described with reference to Figures 9-16 for the assembly operations at the end 2 'of the part of canalisation2 already made a new item 4 as prepared in substantial

[0037] In Figures 9-16, are not shown so as not to overload the drawing the ship or the derrick 5.
Of course, the element 4 is supported on the mast 5 being guided by the guides 37 (FIG. 3), being offset by the heave tensioner 38, which also serves to bring the item to the end 4 2.

[0038] First, as shown in Figure 9, the element 4 is held on the mast 5 in the raised position substantially as shown in Figure 1.
A relatively large distance between the bottom end 4 'of the element 4 from the end 2' of the high part of Line 2 already established.
These two parts are heave compensated, as noted above, can be considered substantially stationary in absolute terms and also relative to one over the other.

[0039] Accordingly, it moves the same movement on the inside of the structure 13 (Figure 3)

[0040] In this relative position and shown in Figure 9 f elements of pipe, is lowered by the winch 41 (FIG. 3) suspended from the cable 42 after removal of the pulley 43 end of the mas
This set of equipment includes a number of devices necessary for safety, measurement and achievement of a good fit on the end 2 'of the pipe.

[0041] As explained above, the winch 41 provides motion compensation of heave equipment gear 44, so that the train 44 is substantially stationary relative to the element 4 itself heav

[0042] In the operations phase shown in Figure 9, the process of internal equipment of the pipeline which includes the cable 11 (FIG. 1) and the safety cap 10, and other safety device
invention, is supported by a winch 46 which may be fixed and supported by the structure 13.
The winch 46 is also one permitting the application of a constant torque and thus the automatic compensation of the heaving movement of the cable supporting the drill 11 to internal e

[0043] In this way, both ends schematized by brackets 49, 50 cables 11 and 42 both heave compensated are relatively immobile in relation to another as long as you do not order a re

[0044] Accordingly, it is easy for example by controlling the winch 41 to bring the two hooks 50, 49 in coincidence (Fig. 10) and thus take over by the winch 44 and 41 equipment equip
security such as the element 47 forming parachute designed to block and stop the cable 11 automatically in line 2, for example in case error in maneuvering for docking hooks 4.9, 50.

[0045] The winch 46 can then be removed while simultaneously or subsequently, the element 4 can be lowered towards the end 2 'by controlling the tensioner 38 (10, 11 and 12).

[0046] Simultaneously, as appears from a comparison of Figures 11 and 12, control the lowering cable 42 of the train equipment so as to bring the elements 44 ', 44 "gear equipment
<1> of the element 4 on the end 2 'of the pipe 2.
The elements 44 ', 44' are advantageously inflatable elements that allow a precise centering of the end 4 'of the element on the end 4 2 <1> Line 2.

[0047] The docking was done perfectly, it will be easy to make the assembly of the element 4 on Line 2 by means of an automatic weld 51 that carries out such a weld at the junction c
The machine 51 will be supported by a heave compensated winch (not shown) and is secured to the pipe at the time of completion of welding, ensuring a perfectly still relative positior
Welding, once completed, the machine 51 to be welded will be rejected and we may proceed by means of an apparatus shown schematically at 52, attached to the pipe in the constru

[0048] Also, at that time, the coating can be done internally by example through one of the devices such as 44 "gear equipment 44.

[0049] From this moment, as shown in Figure 14, we see that the element of line 4 will be released by the tensioner 38-Fon and begins to bring down the entire line 2 the length of the
This descent is as previously stated by the mobile clamp 22 after opening of the clamp 21 which leaves the pipe spinning at the speed of descent controlled by the movement of the m
This downward movement may be made in the course of movement of the movable clamp 22 and the length of the four charged in one or several operations alternatives rise and fall c
If several alternative movements are required, is first off the mobile clamp 22, the clamp 21 is opened, after which the clamp is closed for 21, immobilize and support the pipe, the clam
the clamp 21 fixed to bring down the pipe again.

[0050] It stops the downward movement of the pipe when the top end 4 'of the element 4 assembled on the pipe 2 comes in where there was previously (Figure 9) the end 2' of the pip
in this position shown in Figure 15, we also took care to go by the winch 41 and cable 42 train equipment so they can release the hook 49 of the hook 50 after taking back the cable 1

[0051] After that, it is possible to remove the train equipment and approach 44 (Figure 16) a new piece of pipe as the element 9 previously prepared on the mast 7 with its train of inter
described in Figures 9-15.

[0052] The prediction of the two poles can, as shown schematically in Figures 4-8, a load on one of the poles in the horizontal position of the pipe elements when the other pole is vert
This phase is illustrated in Figure 4 in which the mast 7 supports an element of Line 9 will be installed, while being loaded on the mast 5 in a horizontal position a new item 4.

[0053] Figure 6 shows the phase corresponding to the end of the assembly operation of the element 9, the mast was already observed 5 ready to take the place of the mast 7.

[0054] In Figure 7, is shown in the next phase in which the mast is lowered to 7 horizontal position to receive a new item 9, while the mast 5 was drawn to the vertical position-to the as
The game of the three cylinders 14, 15, 16 can control all the desired relative positions of the masts.

[0055] In Figure 8, we see from the side, which can provide side decks such as retractable as 55 allows storage of many items such as 4 <1>, 9 '(Figure 2) in reserve.

[0056] Many variations may be made to the methods of implementation and operations described.

[0057] For example, the two poles are tilting alternately used advantageously when the pipe elements are assembled tens of meters, each element can be formed for example by thre

[0058] If the elements are shorter, it may possibly be advantageous to use a single mast which will be associated with a magazine capable of automatic load on the mast several elem fall of a piece of pipe

[0059] The invention may be advantageously used for the laying of submarine pipelines for gas or liquids, including hydrocarbons.

[0060] Onnotera that incident, such as cracking of the portion of pipe being laid, especially in the region of the elbow J. one can have a very large abrupt increase in the weight of the ;

[0061] At this point comes in the clamp 30 which prevents the parachute drop across the pipe.

[0062] To remove the pipe and back to a healthy part, can then be used in conjunction with the special pliers clamp parachute recovery on which we can do all the capstans 27, 28 in ; Clip this recovery may be any suitable type may be rooted deep in the exterior of the section of pipe that goes back and is lost anyway.

[0063] In the above description, it was explained that the jump run the pipe from the ship was approximately vertical. "
This corresponds to the principle of placing said ew J. Depending on the depth of installation can vary depending on the circumstances and according to the points of a path of installa closer that the vertical depth of installation is important.
To this end, the invention may include any means (not shown) to change slightly the direction of this axis.